voltage boosting with inverters

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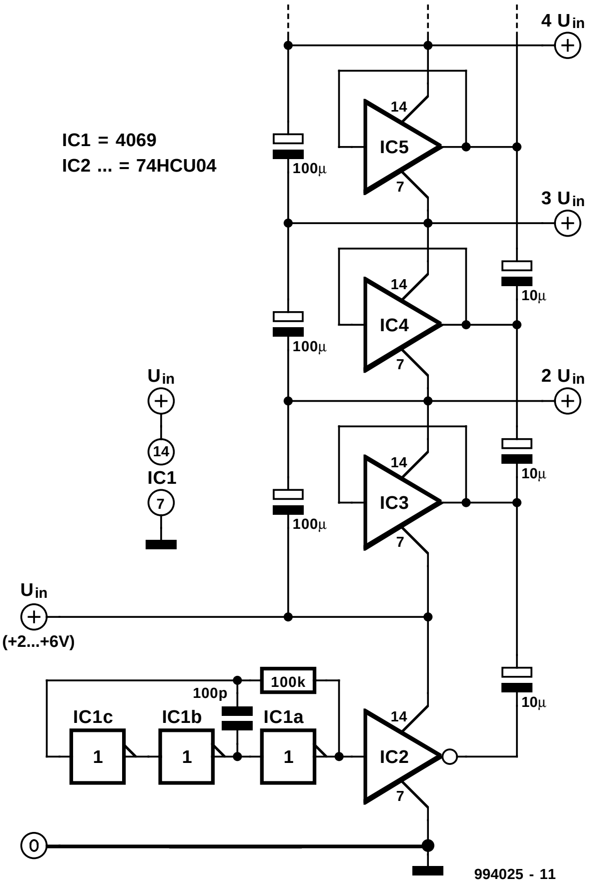

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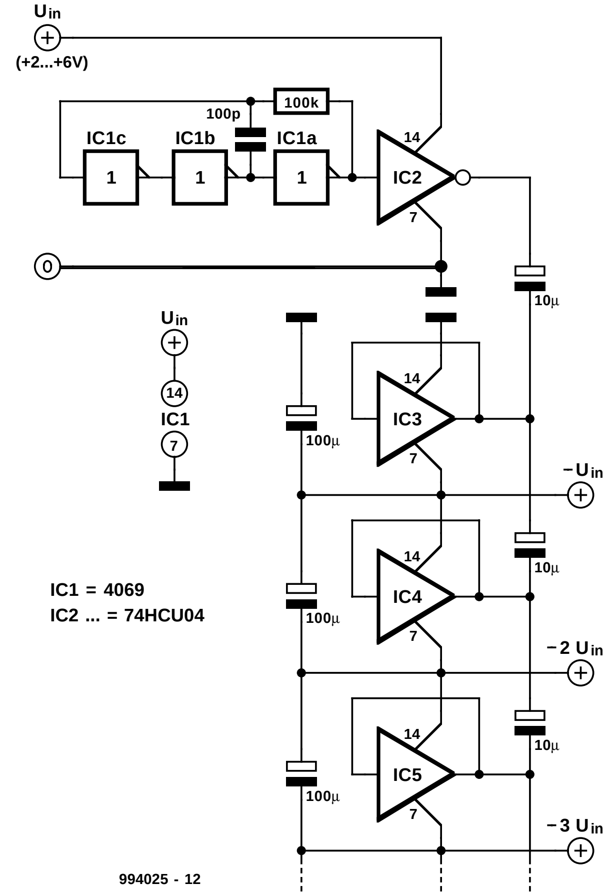

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A ‘tree’ of inverters is highly suitable for boosting a voltage. That in the diagram provides voltages that are whole multiples of the input voltage by clock-driven charging of capacitors. The voltage across the capacitors is added stage by stage to the input voltage. Here, integrated circuits, IC_2–IC_7, each containing six inverters are used. In each IC, except IC_2, one of the inverters is connected in series with the parallel combination of the other five.

Circuit IC_1 is configured as a 50 Hz oscillator that controls inverting driver IC_2. A 10 µF capacitor interlinks the outputs of IC_2 and IC_3. The bidirectional properties of the MOSFET output of IC_3 ensure that the voltage across supply terminals 7 and 14 is identical to the input voltage. The increased voltage, equal to $2V_{IN}$, is filtered by a 100 µF capacitor.

The outputs of IC_3 and IC_4 are also interlinked by a 10 µF capacitor, and a similar process as just described takes place. This continues up to the last IC on the tree.

The efficiency of the booster increases when the clock frequency is lower than 50 Hz, but then the available output current drops. If a current of 5 mA is drawn from the terminal at which $3V_{IN}$ appears, the efficiency is about 90%. However, it drops to around 75% when the current is increased to 15 mA.

The circuit can also be arranged as a voltage-inverting booster. The ICs should then be arranged as shown in Figure 2.

[994025]